Attorney Docket # 502901-155RCE

Patent

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

Waldemar BRINKIS et al.

Serial No.: 10/615,134

Filed: July 8, 2003

For: Electronics Unit

Examiner: Rodela, Eduardo A.
Group Art: 2826

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Alfred W. Froebrich
Name of applicant, assignee or Registered Representative

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Date of Signature

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LETTER TRANSMITTING CERTIFIED TRANSLATION OF PRIORITY DOCUMENT

In order to complete the claim to priority in the above-identified application under 35 U.S.C. §119, enclosed herewith is a certified translation of German Priority Document No. 102 30 712.1 filed July 8, 2002.

Respectfully submitted,
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April 28, 2008

UNITED STATES PATENT AND TRADEMARK OFFICE

I, Derek Ernest LIGHT BA, BDÜ,

translator to RWS Group Ltd, of Europa House, Marsham Way, Gerrards Cross, Buckinghamshire, England declare;

1. That I am a citizen of the United Kingdom of Great Britain and Northern Ireland.

2. That I am well acquainted with the German and English languages.

3. That the attached is, to the best of my knowledge and belief, a true translation into the English language of the accompanying copy of the specification filed with the application for a patent in Germany on July 8, 2002 under the number 102 30 712.1 and the official certificate attached thereto.

4. That I believe that all statements made herein of my own knowledge are true and that all statements made on information and belief are true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the patent application in the United States of America or any patent issuing thereon.

For and on behalf of RWS Group Ltd

The 23rd day of April 2008

FEDERAL REPUBLIC OF GERMANY

Priority Certificate
for the filing of a Patent Application

File Reference:	102 30 712.1
Filing date:	8 July 2002
Applicant/Proprietor:	Siemens Aktiengesellschaft, Munich/DE
Title:	Electronics unit
IPC:	H 01 L 23/485

The attached documents are a correct and accurate reproduction of the original submission for this application.

Munich, 24 June 2003
German Patent and Trademark Office
The President
pp

[seal of the German Patent and Trademark Office]

[signature]
Wehner

Description

Electronics unit

The invention relates to an electronics unit having a low multi-point metallic mount, on which an insulating layer is arranged, a conductor track system is arranged on the insulating layer and electronic power components are arranged on the conductor track system.

For electronic units such as these, it is known for the conductor track system to be thermally linked to the mount, which is used as a heat sink, by means of a heat transmission medium such as thermally conductive paste or a thermally conductive adhesive. In this case, both the heat transfer in the heat transmission medium and that in the mount must be taken into account for dissipation of the heat that is produced by the power components. Since the heat transmission media make up the majority of the thermal resistance of the electronics unit, the heat dissipation which can be achieved is restricted such that it is largely inadequate for precision electronics.

The object of the invention is thus to provide an electronics unit and a method for producing an electronics unit, which electronics unit allows good heat dissipation of the heat that is produced by the power components, with a simple design and the capability to produce it easily.

For an electronics unit, this object is achieved in that the insulating layer is a sintered electrically insulating polymer layer on which the conductor track system, which comprises a sintered glass frit with a noble metal filling, is arranged.

This embodiment results in the heat transfer from the power components to the mount and from the mount to the environment being sufficiently good to ensure that the heat which is

produced by the power components is dissipated as required for precision electronics.

In this case, the polymer layer and the conductor track system can be arranged without any problems not only on planar surfaces but also on three-dimensional surfaces of the mount. The polymer layer and the conductor track system may in this case be passed over various planes such as inclines and rounded areas and, in a corresponding manner, the power components can also be placed at widely differing points on the mount.

The layers in this layer system can be applied to the mount either directly or in a transfer process, with a small number of operations.

There is no need for any pretreatments whatsoever to the mount surface, for example chemical pretreatment.

It is advantageous for the noble metal filling to be a silver filling or a filling containing silver.

If the glass frit is a low melting-point glass frit, in particular with a considerably lower melting point than the melting point than the melting point of the material of the mount, then the glass frit can be sintered onto the mount without any problems.

The metallic mount is preferably composed of a material having a melting point below 600°C. In this case, it can be produced easily and is highly thermally conductive if the mount is composed of aluminum or of an aluminum alloy.

The mount may have cooling ribs in order to increase the heat dissipation to the environment.

The power components may be power semiconductor elements and/or driver components or driver electronics.

Furthermore, electrical and/or electronic components may also be arranged on the conductor track system, in order to complete the circuit.

The conductor track system, which is in the form of a thick film allows the power components and/or electrical and/or electronic components to be conductively connected to the conductor track system by soldering and/or by bonding.

The electrically insulating polymer layer preferably has a thickness of above >20 µm. In this case, the polymer layer should be as homogeneous as possible, and should have no pores or air bubbles.

In order to make it possible to arrange extensive electronics on a small area of the mount, a further insulating layer, which is composed of a sintered polymer may be arranged on the conductor track system and on the electronic power components, and a further conductor track system, which comprises a sintered glass frit with noble metal filling, is arranged on the further insulating layer, and further electronic power components are arranged on the further conductor track system.

Further layer systems, which comprise a polymer layer and a conductor track system, may also be applied in the same way.

In the case of a method, the object is achieved in that an electrically insulating polymer layer is applied to the mount, is dried and is sintered in a temperature process, in that the conductor track system is applied to the polymer layer as a paste system comprising a low melting-point glass frit with noble metal filling, is dried and is sintered in a temperature

process, and in that the electronic power components are then arranged conductively on the conductor track system.

In this case, the sintering process is controlled in such a way that the polymer layer is not burnt away, but such that the chemical/physical characteristics of the polymer base material are retained. Thus, in this case, not only are the insulating characteristics of the polymer layer retained, but the conductivity of the conductor track system is also produced.

The polymer layer and conductor track system can be printed easily and at low cost, in particular by using the screen and printing method.

In order to reduce the number of operations, the temperature processes for sintering the polymer layer and for sintering the conductor track system may be carried out as a joint sintering process.

The drying process for the polymer layer and/or for the conductor track system is preferably carried out at a temperature of about 150°C.

In the process, the solvent can vaporize from the polymer layer and from the material of the conductor track system.

The temperature process for sintering the polymer layer is preferably carried out at a temperature of about 200°C, and lasts for about one hour.

In order to apply the layer system in a simple manner using the transfer process, a layer assembly comprising an electrically insulating polymer layer and a conductor track system which is arranged on the polymer layer and comprises a paste system composed of a low melting-point glass frit with no metal filling can be applied to a flexible mount and can be dried,

the layer assembly can be applied together with the polymer layer on the mount such that it rests on the mount, and the flexible mount can be separated from the layer assembly, and the layer assembly can be sintered onto the mount in a temperature process.

If the temperature process for sintering the polymer layer and/or for sintering the layer system or for sintering the layer assembly is carried out in a controlled manner at a temperature of between about 450°C and 550°C, preferably at about 500°C, then the polymer layer and its insulating characteristics are retained, while the material of the conductor track system becomes electrically conductive.

The electronic power components and/or electrical and/or electronic components can be arranged conductively on the conductor track system in a simple manner by soldering and/or by bonding and/or by conductive adhesive bonding.

One exemplary embodiment of the invention is illustrated in the drawing and will be described in more detail in the following text. The single figure of the drawing shows a cross-sectional view of an electronics unit.

The illustrated electronics unit has a mount 1 composed of aluminum, which is provided with cooling ribs 2 on one of its faces.

An electrically insulating polymer layer 3 with a thickness of 20 µm is printed by screen printing and is sintered on the opposite surface to the cooling ribs 2.

A conductor track system with three conductor tracks 4, 5 and 6 and composed of a glass frit with a silver filling is then printed as a paste system onto the polymer layer 3 and is subsequently sintered, with a resistance layer 7 being printed

onto the polymer layer 3 within one area of the conductor track 6.

A power semiconductor element 8 is arranged on the conductor track 5 and is connected to the conductor track 4 via a bonding wire 9.

An electronic component 10 which is in the form of an SMD component is soldered by its first contact surface 11 to the conductor track 5, and is soldered by its second contact surface 12 to the conductor track 6.

Patent claims

1. An electronics unit having a low multi-point metallic mount, on which an insulating layer is arranged, a conductor track system is arranged on the insulating layer and electronic power components are arranged on the conductor track system, characterized in that the insulating layer is a sintered electrically insulating polymer layer (3) on which the conductor track system, which comprises a sintered glass frit with a noble metal filling, is arranged.

2. The electronics unit as claimed in claim 1, characterized in that the noble metal filling is a silver filling or a filling containing silver.

3. The electronics unit as claimed in one of the preceding claims, characterized in that the glass frit is a low melting-point glass frit.

4. The electronics unit as claimed in one of the preceding claims, characterized in that the mount (1) is composed of aluminum, or of an aluminum alloy.

5. The electronics unit as claimed in one of the preceding claims, characterized in that the mount (1) has cooling ribs (2).

6. The electronics unit as claimed in one of the preceding claims, characterized in that the power components are power semiconductor elements (8) and/or driver components.

7. The electronics unit as claimed in one of the preceding claims, characterized in that electrical and/or electronic components are arranged on the conductor track system.

8. The electronics unit as claimed in one of the preceding claims, characterized in that the power components and/or electrical and/or electronic components are conductively connected to the conductor track system by soldering and/or by bonding.

9. The electronics unit as claimed in one of the preceding claims, characterized in that the electrically insulating polymer layer (3) has a thickness of about >20 µm.

10. The electronics unit as claimed in one of the preceding claims, characterized in that a further insulating layer, which is composed of a sintered polymer, is arranged on the conductor track system and on the electronic power components, and a further conductor track system, which comprises a sintered glass frit with noble metal filling, is arranged on the further insulating layer, and further electronic power components are arranged on the further conductor track system.

11. A method for producing an electronics unit as claimed in one of claims 1 to 10, characterized in that an electrically insulating polymer layer (3) is applied to the mount (1), is dried and is sintered in a temperature process, in that the conductor track system is applied to the polymer layer (3) as a paste system comprising a low melting-point glass frit with noble metal filling, is dried and is sintered in a temperature process, and in that the electronic power components are then arranged conductively on the conductor track system.

12. The method as claimed in claim 11, characterized in that the temperature processes for sintering the polymer layer (3) and for sintering the conductor track system are carried out as a joint sintering process.

13. The method as claimed in one of claims 11 and 12, characterized in that the drying process or the polymer layer

(3) and/or for the conductor track system is carried out at a temperature of about 150°C.

14. The method as claimed in one of claims 11 to 13, characterized in that the temperature process for sintering the polymer layer (3) is carried out at a temperature of about 200°C.

15. The method as claimed in claim 14, characterized in that the temperature process for sintering the polymer layer (3) is carried out for about one hour.

16. The method for producing an electronics unit as claimed in one of claims 1 to 10, characterized in that a layer assembly comprising an electrically insulating polymer layer and a conductor track system which is arranged on the polymer layer and, as the paste system, comprises a low melting-point glass frit with noble metal filling, is applied to a flexible mount and is dried, in that the layer assembly together with the polymer layer on the mount is applied such that it rests on the mount, and flexible mount is disconnected from the layer assembly, and in that the layer assembly is sintered onto the mount in a temperature process.

17. The method as claimed in one of claims 11 to 16, characterized in that the temperature process for sintering the polymer layer (3) and/or for sintering the layer system or for sintering the layer assembly is carried out at a temperature of between about 450°C and 550°C, preferably at about 500°C.

18. The method as claimed in one of claims 11 to 17, characterized in that the electronic power components and/or the electrical and/or electronic components are arranged conductively on the conductor track system by soldering and/or by bonding and/or by adhesive bonding.

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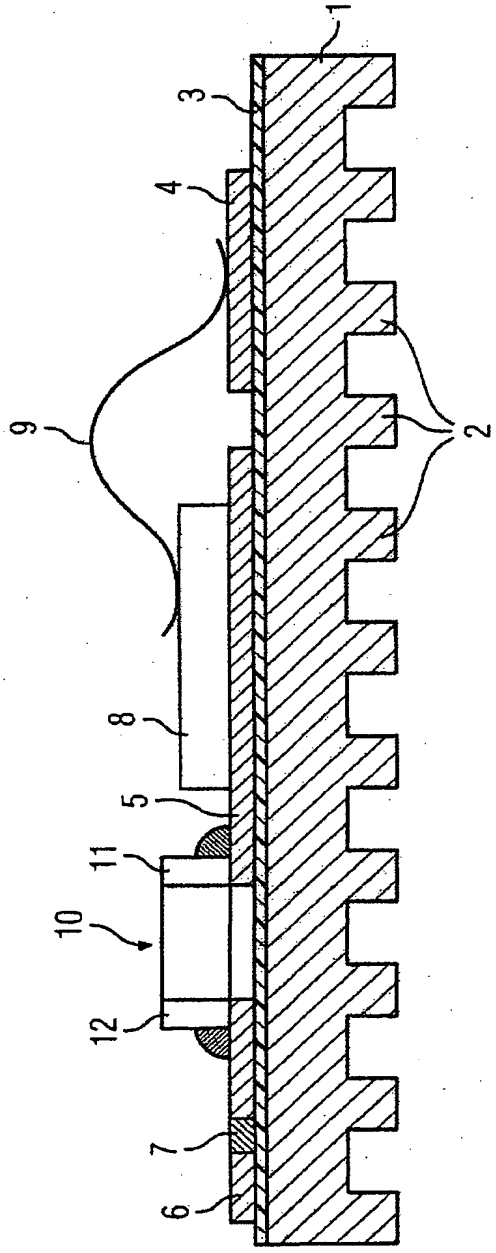
Abstract

Electronics unit

The invention relates to an electronics unit having a low multi-point metallic mount 1, on which an insulating layer is arranged, a conductor track system is arranged on the insulating layer and electronic power components are arranged on the conductor track system. The insulating layer is a sintered electrically insulating polymer layer 3 on which the conductor track system, which comprises a sintered glass frit with a noble metal filling, is arranged.

(single figure of the drawing)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